

## ***EE/CprE/SE 4910 WEEKLY REPORT 9***

***11/8/24 – 11/14/24***

***Group number: 40***

***Project title: 3D Gaussian Splatting With Dynamically Raytraced Lighting***

***Client: Jackson Vanderheyden & Brian Xicon***

***Advisor: Simanta Mitra***

### ***Team Members/Role:***

Ethan Gasner - Documentation Manager.

Kyle Kohl - Communication Manager.

Jackson Vanderheyden - Graphics Scope Manager.

Brian Xicon - Machine Learning Scope Manager.

Luke Broglio - Schedule Manager.

### **Weekly Summary:**

This week, progress was made across several tasks. A package import issue was resolved for Structure from Motion work, while a triangle mesh ray tracer prototype was developed in Unity to render scenes with basic material colors. Work also began on a compute shader for building a bounding volume hierarchy, and research continued on the Gaussian Optimizer in preparation for an upcoming lighting discussion.

### **Past week accomplishments**

**Ethan Gasner:** This past week I was investigating the library to help us in the Structure from motion portion of ML. I found a library that is open source called Colmap to help. I attempted to start a prototype with Colmap but was encountering issues with the package not wanting to be recognized by my computer. Fortunately, while doing homework for Coms 474 (A machine learning class), I found out I was improperly importing packages into my environment. So I now know the solution to my problem.

**Kyle Kohl:** For this last week, I was researching a library to run the Pytorch code inside of Unity. Encountered several problems and I am still working through them.

**Jackson Vanderheyden:** Developed a triangle mesh ray tracer prototype in Unity. It can parse scene data such as camera parameters and object properties (materials and meshes). It renders the scene using a classic pin-hole camera. No lighting calculations are being done, so the final pixel color is

determined by the path closest intersection's material color.

**Luke Broglio:** This week I started to work on the compute shader which builds the bounding volume hierarchy. I started this process by doing research into the process of creating BVHs and specifically using a surface area heuristic and then created a branch where I started work on developing the shader itself.

**Brian Xicon:** This week I continued a basic implementation of the Gaussian Optimizer. However, I focused most of my time reading over and getting a much broader understanding of our project in preparation for our lighting talk.

○ Individual contributions

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Ethan Gasner	Found a Library to assist in SfM named Colmap. Attempted to create a prototype, encountered Issues but found a solution.	6	54
Kyle Kohl	Researched a Library for running ML inside of Unity.	6	54
Brian Xicon	Gaussian Point Optimizer implementation and research of broader understanding of our project.	6	54
Jackson Vanderheyden	Developed a triangle mesh ray tracer in Unity which will serve as the foundation of our hybrid rendering solution.	6	54
Luke Broglio	Did research into BVH construction and started work on BVH for our raytracer.	6	54

○ Plans for the upcoming week

**Ethan Gasner:** My plan for this upcoming week is to use the solution I encountered to finally be able to create a prototype for the structure from motion. I plan to use the “tankandtemples” dataset on our git repository for this prototype.

**Kyle Kohl:** I plan to get Pytorch Code running in Unity via the Library. I feel like I am close. Once I am done with that I will begin investigating what it takes to make a Unity Package to put all our code in.

**Jackson Vanderheyden:** I will continue developing the ray tracer to support dynamic scenes (moving objects/viewpoints), Unity lighting, PBR model lighting, accumulation buffers, and Gaussian support. This will be a multi-week process.

**Luke Broglio:** I plan to finish the BVH construction compute shader this week and work to integrate with the raytracer itself.

**Brian Xicon:** Next week I plan to finish my implementation for the tanksandtemples dataset parser to be able to have a working Gaussian Point Optimizer demonstration.

- **Summary of weekly advisor meeting**

We met with Professor Mitra to update him on our progress and presented our Lightning talk as this week was our group's assigned class presentation date; the theme was Prototypes. He was pleased with our work so far and is eager to see the next steps.